

molecules present different peptides. The inventors have demonstrated that an epitope that binds to a single HLA class I allele expressed in a subject is essential, but not sufficient to induce tumor specific T cell responses. Instead tumour specific T cell responses are optimally activated when an epitope is recognised and presented by the HLA molecules encoded by at least three HLA class I genes of an individual (PCT/EP2018/055231, PCT/EP2018/055232, PCT/EP2018/055230, EP 3370065 and EP 3369431).

Based on this discovery the inventors have developed a method for designing and preparing peptides to induce T cell responses in the highest proportion of subjects in a given target human population and have used this method to design a set of peptides for use in treating cancer.

In one aspect, the present disclosure provides a panel of two or more peptides, or one or more polynucleic acids or vectors that encode a panel of two or more peptides, wherein each of the peptides, or each of the encoded peptides, is up to 50 amino acids in length, wherein each peptide or encoded peptide comprises a different amino acid sequence selected from any of SEQ ID NOs: 1 to 2786 and/or 5432-5931, and wherein the amino acid sequence selected from each peptide or encoded peptide is a fragment of a different cancer-associated antigen listed in Table 24.

In another aspect, the present disclosure provides a polynucleic acid or a vector that encodes a peptide as described herein that is up to 50 amino acids in length, and that comprises the amino acid sequence of any of SEQ ID NOs: 1 to 2786 and/or 5432-5931. In another aspect, the present disclosure provides a pharmaceutical composition or kit, comprising one or more peptides, or one or more polynucleic acids or vectors that encode one or more peptides, wherein the one or more peptide, or encoded peptide, is up to 50 amino acids in length and comprises the amino acid sequence of any of SEQ ID NOs: 1 to 2786 and/or 5432-5931, wherein the composition or kit optionally comprises at least one pharmaceutically acceptable diluent, carrier, or preservative. In yet another aspect, the present disclosure provides a method of predicting that a specific human subject will have a CD8⁺ T cell response and/or a CD4⁺ T cell response to each peptide, or encoded peptide, of a pharmaceutical composition or kit according to claim 5, the method comprising (i) a. determining that each peptide, or encoded peptide comprises at least one amino acid sequence that is a T cell epitope capable of binding to at least three HLA class I molecules of the subject; and b. predicting that the subject will have a CD8⁺ T cell response to each peptide or encoded peptide of the pharmaceutical composition or kit; and/or (ii) a. determining that each peptide, or encoded peptide comprises at least one amino acid sequence

that is a T cell epitope capable of binding to at least three HLA class II molecules of the subject; and b. predicting that the subject will have a CD4⁺ T cell response to each peptide or encoded peptide of the pharmaceutical composition or kit.

In yet another aspect, the present disclosure provides use of the pharmaceutical composition as described herein in the manufacture of a medicament for treating cancer, optionally bladder cancer, brain cancer, breast cancer, colorectal cancer, gastric cancer, hepatocellular cancer, leukemia, lung cancer, lymphoma, melanoma, ovarian cancer, pancreatic cancer, pediatric cancer, thyroid cancer, prostate cancer, kidney cancer, head and neck cancer, esophageal cancer and cervical cancer.

In yet another aspect, the present disclosure provides a method of preparing a pharmaceutical composition or kit for treating cancer in a specific human subject, the method comprising a. selecting two or more peptides, or one or more polynucleic acids or vectors that encode two or more peptides, wherein each peptide, or each encoded peptide, is up to 50 amino acids in length and comprises an amino acid sequence selected from SEQ ID NOs: 1 to 2786 and/or 5432-5931 that comprises a T cell epitope capable of binding to at least three HLA class I alleles and/or a T cell epitope capable of binding to at least three HLA class II alleles of the specific human subject; and b. preparing a pharmaceutical composition or kit comprising the two or more peptides, or one or more polynucleic acids or vectors selected in step a. In yet another aspect, the present disclosure provides a method of designing or preparing a peptide, or a polynucleic acid or vector that encodes a peptide, or a panel of peptides, or one or more polynucleic acid or vectors that encode a panel of peptides, for use in a method of inducing a T cell response against a target polypeptide, the method comprising

(i) selecting or defining a model human population comprising a plurality of subjects each defined by HLA class I genotype and/or by HLA class II genotype;

(ii) identifying for each subject of the model population:

(a) amino acid sequences of the target polypeptide that are a T cell epitope capable of binding to at least three HLA class I molecules of the subject;

(b) amino acid sequences of the target polypeptide that are a T cell epitope capable of binding to at least three HLA class II molecules of the subject;

(c) amino acid sequences of the target polypeptide that comprise a T cell epitope capable of binding to at least three HLA class I molecules of the subject and a T cell epitope capable of binding to at least three HLA class II molecules of the subject; or

(d) amino acid sequences of the target polypeptide that both

a. are a T cell epitope capable of binding to at least three HLA class II molecules; and

b. comprise an amino acid sequence that is a T cell epitope capable of binding to at least three HLA class I molecules of the subject;

- 5 (iii) selecting a polypeptide fragment window length of between 9 and 50 amino acids;
- (iv) identifying a fragment of the target polypeptide that
- (a) has the length selected in step (iii); and
- (b) comprises an amino acid sequence identified in any one of step (ii) (a) to (d)
- 10 in the highest proportion of subjects in the model population;
- (v) optionally testing the fragment identified in step (iv) against additional pre-defined criteria, rejecting the fragment if the further pre-defined criteria are not met, and repeating step (iv) to identify an alternative fragment of the target polypeptide that

- 15 (a) has the length selected in step (iii); and
- (b) comprises an amino acid sequence identified in step (iv) in the next highest proportion of subjects in the model population;
- (vi) optionally repeating step (iv) and further optionally step (v) in one or more further rounds, wherein a further fragment of the target polypeptide is identified in each
- 20 round, and wherein in each round subjects are excluded from the model population if any of the fragments selected in step (iv) and not rejected in step (v) of any of the preceding rounds comprises an amino acid sequence identified in step (ii) for that subject; and

- (vii) designing or preparing a peptide, a polynucleic acid or vector that encodes a
- 25 peptide, a panel of peptides, or one or more polynucleic acids or vectors that encode a panel of peptides, wherein each peptide comprises one or more of the target polypeptide fragments identified in step (iv), (v) or (vi), optionally wherein the polypeptide fragment is flanked at the N and/or C terminus by additional amino acids that are not part of the sequence of the target polypeptide antigen.

30 In yet another aspect, the present disclosure provides a panel of peptides, polynucleic acids or vectors designed and/or prepared according to the method as described herein, or comprising or encoding two or more peptides designed and/or prepared according to the method as described herein, or a panel of peptides, polynucleic acids or vectors selected according to the

method as described herein. In a further aspect, the present disclosure provides a pharmaceutical composition or kit comprising a panel of peptides, or one or more polynucleic acids or vectors encoding a panel of peptides, as described herein, wherein the composition or kit optionally comprises at least one pharmaceutically acceptable diluent, carrier, or preservative.

5 Accordingly, in a first example the disclosure provides a peptide of up to 50 amino acids in length and comprising the amino acid sequence of any of SEQ ID NOs: 1 to 2786 and/or 5432-5931.

 In a further example, the disclosure provides a polynucleic acid or a vector that encodes a peptide of up to 50 amino acids in length and comprising the amino acid sequence of any of SEQ
10 ID NOs: 1 to 2786 and/or 5432-5931.

 In a further example, the disclosure provides a panel of two or more of the peptides or two or more of the polynucleic acids or vectors, wherein each peptide comprises, or each polynucleic acid or vector encodes a peptide that comprises, a different amino acid sequence selected from SEQ ID NOs: 1 to 2786 and/or 5432-5931.

15 In a further example, the disclosure provides a pharmaceutical composition or kit, comprising one or more of the peptides, polynucleic acids, vectors or panels, wherein the composition or kit optionally comprise at least one pharmaceutically acceptable diluent, carrier, or preservative.

 In a further example, the disclosure provides a method of predicting that a specific human
20 subject will have a cytotoxic T cell response and/or a helper T cell response to administration of the pharmaceutical composition or the peptides, polynucleic acids or vectors of the kit, the method comprising

- (i) a. determining that the one or more peptides, or encoded peptides, of the pharmaceutical composition or kit, comprise at least one amino acid sequence that
25 is a T cell epitope capable of binding to at least three HLA class I molecules of the subject; and
- b. predicting that the subject will have a cytotoxic T cell response to administration of the pharmaceutical composition; or
- (ii) a. determining that the one or more peptides, or encoded peptides, of the
30 pharmaceutical composition or kit comprise at least one amino acid sequence that is a T cell epitope capable of binding to at least three HLA class II molecules of the subject; and

- b. predicting that the subject will have a helper T cell response to administration of the pharmaceutical composition.

In a further example, the disclosure provides a method of vaccination, providing immunotherapy or inducing a cytotoxic T cell response in a subject, the method comprising administering to the subject the pharmaceutical composition or the peptides, polynucleic acids or vectors of the kit.

In further examples, the disclosure provides

- the pharmaceutical composition or the peptides, polynucleic acids or vectors of the kit described above for use in a method of vaccination, providing immunotherapy or inducing a cytotoxic T cell response in a subject; and
- use of the peptides or polynucleic acids as described above in the manufacture of a medicament for vaccination, providing immunotherapy or inducing a cytotoxic T cell response in a subject.

In a further example, the disclosure provides a method of preparing a pharmaceutical composition or kit for use in a method of treating cancer in a specific human subject, the method comprising

- a. selecting two or more peptides, or one or more polynucleic acids or vectors according that encode at least two peptides, wherein each peptide, or encoded peptide, comprises an amino acid sequence selected from SEQ ID NOs: 1 to 2786 and/or 5432-5931 that comprises a T cell epitope capable of binding to at least three HLA class I alleles and/or a T cell epitope capable of binding to at least three HLA class II alleles of the specific human subject; and
- b. preparing a pharmaceutical composition or kit comprising the two or more peptides, or one or more polynucleic acids or vectors selected in step a.

In a further example, the disclosure provides a method of designing, or preparing a peptide, or a polynucleic acid or vector that encodes a peptide, or a panel of peptides, or one or more polynucleic acid or vectors that encode a panel of peptides, for use in a method of inducing a T cell response against a target polypeptide, the method comprising

- (i) selecting or defining a model human population comprising a plurality of subjects each defined by HLA class I genotype and/or by HLA class II genotype;
- (ii) identifying for each subject of the model population:
 - (a) amino acid sequences of the target polypeptide that are a T cell epitope capable of binding to at least three HLA class I molecules of the subject;

- (b) amino acid sequences of the target polypeptide that are a T cell epitope capable of binding to at least three HLA class II molecules of the subject;
- (c) amino acid sequences of the target polypeptide that comprise a T cell epitope capable of binding to at least three HLA class I molecules of the subject and a T cell epitope capable of binding to at least three HLA class II molecules of the subject; or
- (d) amino acid sequences of the target polypeptide that both
- i. are a T cell epitope capable of binding to at least three HLA class II molecules; and
 - ii. comprise an amino acid sequence that is a T cell epitope capable of binding to at least three HLA class I molecules of the subject;
- (iii) selecting a polypeptide fragment window length of between 9 and 50 amino acids;
- (iv) identifying a fragment of the target polypeptide that
- (a) has the length selected in step (iii); and
 - (b) comprises an amino acid sequence identified in any one of step (ii) (a) to (d) in the highest proportion of subjects in the model population;
- (v) optionally testing the fragment identified in step (iv) against additional pre-defined criteria, rejecting the fragment if the further pre-defined criteria are not met, and repeating step (iv) to identify an alternative fragment of the target polypeptide that
- (a) has the length selected in step (iii); and
 - (b) comprises an amino acid sequence identified in step (iv) in the next highest proportion of subjects in the model population;
- (vi) optionally repeating step (iv) and further optionally step (v) in one or more further rounds, wherein a further fragment of the target polypeptide is identified in each round, and wherein in each round subjects are excluded from the model population if any of the fragments selected in step (iv) and not rejected in step (v) of any of the preceding rounds comprises an amino acid sequence identified in step (ii) for that subject; and
- (vii) designing or preparing a peptide, a polynucleic acid or vector that encodes a peptide, a panel of peptides, or one or more polynucleic acids or vectors that encode a panel of peptides, wherein each peptide comprises one or more of the target polypeptide fragments identified in step (iv), (v) or (vi), optionally wherein

the polypeptide fragment is flanked at the N and/or C terminus by additional amino acids that are not part of the sequence of the target polypeptide antigen.

In a further example, the disclosure provides a panel peptides, polynucleic acids or vectors designed and/or prepared according to the method, or comprising or encoding two or more peptides designed and/or prepared according to the method.

In a further example, the disclosure provides a panel of peptides, or one or more polynucleic acids or vectors encoding a panel of peptides, for use in a method of inducing a T cell response against one or more target polypeptides in a subject of a target human population, wherein each of the peptides, or encoded peptides, comprises an amino acid sequence that is

(a) 9 to 50 amino acids in length; and

(b) comprises a fragment of the one or more target polypeptides, wherein the fragment comprises, in at least 10% of subjects of the intent-to-treat human population:

a. an amino acid sequence of the target polypeptide that is a T cell epitope capable of binding to at least three HLA class I molecules of the subject;

b. an amino acid sequence of the target polypeptide that is a T cell epitope capable of binding to at least three HLA class II molecules of the subject;

c. an amino acid sequence of the target polypeptide that comprise a T cell epitope capable of binding to at least three HLA class I molecules of the subject and a T cell epitope capable of binding to at least three HLA class II molecules of the subject; or

d. an amino acid sequence of the target polypeptide that both

i. is a T cell epitope capable of binding to at least three HLA class II molecules; and

ii. comprise an amino acid sequence that is a T cell epitope capable of binding to at least three HLA class I molecules of the subject.

In a further example, the disclosure provides a pharmaceutical composition or kit comprising the panel of peptides, or one or more polynucleic acids or vectors encoding the panel of peptides, wherein the composition or kit optionally comprises at least one pharmaceutically acceptable diluent, carrier, or preservative.

In a further example, the disclosure provides a method of vaccination, providing immunotherapy or inducing a cytotoxic T cell response in a subject, the method comprising administering to the subject a pharmaceutical composition or the panel of peptides, polynucleic acids or vectors of the kit.

The disclosure will now be described in more detail, by way of example and not limitation, and by reference to the accompanying drawings. Many equivalent modifications and variations will be apparent, to those skilled in the art when given this disclosure. Accordingly, the exemplary examples of the disclosure set forth are considered to be illustrative and not limiting. Various changes to the described examples may be made without departing from the scope of the disclosure. All documents cited herein, whether supra or infra, are expressly incorporated by reference in their entirety.

The present disclosure includes the combination of the examples and preferred features described except where such a combination is clearly impermissible or is stated to be expressly avoided. As used in this specification and the appended claims, the singular forms “a”, “an”, and “the” include plural referents unless the content clearly dictates otherwise. Thus, for example, reference to “a peptide” includes two or more such peptides.

Section headings are used herein for convenience only and are not to be construed as limiting in any way.

Description of the Figures

Fig. 1

ROC curve of HLA restricted PEPI biomarkers.

Fig. 2

CLAIMS

1. A panel of two or more peptides, or one or more polynucleic acids or vectors that encode a panel of two or more peptides, wherein each of the peptides, or each of the encoded peptides, is up to 50 amino acids in length, wherein each peptide or encoded peptide comprises a different amino acid sequence selected from any of SEQ ID NOs: 1 to 2786 and/or 5432-5931, and wherein the amino acid sequence selected from SEQ ID NOs: 1 to 2786 and/or 5432-5931 of each peptide or encoded peptide is a fragment of a different cancer-associated antigen listed in Table 24.
2. A polynucleic acid or a vector that encodes a peptide according to claim 1 that is up to 50 amino acids in length, and that comprises the amino acid sequence of any of SEQ ID NOs: 1 to 2786 and/or 5432-5931.
3. The panel of peptides, polynucleic acid(s) or vector(s) according to claim 1, wherein each of the peptides or encoded peptides comprises at least one amino acid sequence selected from one of the following groups:
 - (a) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a breast cancer-associated antigen listed in Table 24;
 - (b) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a lung cancer-associated antigen listed in Table 24;
 - (c) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a prostate cancer-associated antigen listed in Table 24;
 - (d) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a colorectal cancer-associated antigen listed in Table 24;
 - (e) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a bladder cancer-associated antigen listed in Table 24;

- (f) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of an ovarian cancer-associated antigen listed in Table 24;
- (g) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a pancreatic cancer-associated antigen listed in Table 24;
- (h) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a brain cancer-associated antigen listed in Table 24;
- (i) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a leukemia-associated antigen listed in Table 24;
- (j) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a lymphoma-associated antigen listed in Table 24;
- (k) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a hepatocellular cancer-associated antigen listed in Table 24;
- (l) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a melanoma-associated antigen listed in Table 24;
- (m) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a thyroid cancer-associated antigen listed in Table 24;
- (n) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a pediatric cancer-associated antigen listed in Table 24;
- (o) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a gastric cancer-associated antigen listed in Table 24;
- (p) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a kidney cancer-associated antigen listed in Table 24

- (q) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a head and neck cancer-associated antigen listed in Table 24; and
 - (r) the sequences listed in Table 25A and/or Table 25B and indicated in Table 25A or 25B to be a fragment of a cervical cancer-associated antigen listed in Table 24.
- 4. A pharmaceutical composition or kit, comprising one or more peptides, or one or more polynucleic acids or vectors that encode one or more peptides, wherein the one or more peptide, or encoded peptide, is up to 50 amino acids in length and comprises the amino acid sequence of any of SEQ ID NOs: 1 to 2786 and/or 5432-5931, wherein the composition or kit optionally comprises at least one pharmaceutically acceptable diluent, carrier, or preservative.
 - 5. The pharmaceutical composition or kit of claim 4, comprising at least two peptides, or one or more polynucleic acids or vectors that encode at least two peptides, wherein each peptide, or each encoded peptide, is up to 50 amino acids in length and comprises an amino acid sequence selected from SEQ ID NOs: 1 to 2786 and/or 5432-5931 that comprises a T cell epitope capable of binding to at least three HLA class I alleles and/or a T cell epitope capable of binding to at least three HLA class II alleles of an individual human subject.
 - 6. A method of predicting that a specific human subject will have a CD8⁺ T cell response and/or a CD4⁺ T cell response to each peptide, or encoded peptide, of a pharmaceutical composition or kit according to claim 5, the method comprising
 - (i) a. determining that each peptide, or encoded peptide comprises at least one amino acid sequence that is a T cell epitope capable of binding to at least three HLA class I molecules of the subject; and
 - b. predicting that the subject will have a CD8⁺ T cell response to each peptide or encoded peptide of the pharmaceutical composition or kit; and/or

- (ii)
 - a. determining that each peptide, or encoded peptide comprises at least one amino acid sequence that is a T cell epitope capable of binding to at least three HLA class II molecules of the subject; and
 - b. predicting that the subject will have a CD4⁺ T cell response to each peptide or encoded peptide of the pharmaceutical composition or kit.
- 7. The pharmaceutical composition or kit according to claim 4 or claim 5 for use in therapy for vaccination, providing immunotherapy or inducing a cytotoxic T cell response in a subject, wherein the pharmaceutical composition or the peptides, polynucleic acids or vectors of the kit are to be administered to the subject.
- 8. The pharmaceutical composition or kit according to claim 7, wherein the therapy is prophylactic.
- 9. The pharmaceutical composition or kit according to claim 7 or claim 8, wherein the pharmaceutical composition or the peptides, polynucleic acids or vectors of the kit have been predicted to induce a cytotoxic T cell response and/or a helper T cell response in the subject using a method according to claim 6.
- 10. The pharmaceutical composition or kit according to any one of claims 7 to 9 wherein the therapy is for treating cancer, optionally bladder cancer, brain cancer, breast cancer, colorectal cancer, gastric cancer, hepatocellular cancer, leukemia, lung cancer, lymphoma, melanoma, ovarian cancer, pancreatic cancer, pediatric cancer, thyroid cancer, prostate cancer, kidney cancer, head and neck cancer, esophageal cancer and cervical cancer.
- 11. Use of the pharmaceutical composition of claim 4 or claim 5 in the manufacture of a medicament for treating cancer, optionally bladder cancer, brain cancer, breast cancer, colorectal cancer, gastric cancer, hepatocellular cancer, leukemia, lung cancer, lymphoma, melanoma, ovarian cancer, pancreatic cancer, pediatric cancer,

thyroid cancer, prostate cancer, kidney cancer, head and neck cancer, esophageal cancer and cervical cancer.

12. A method of preparing a pharmaceutical composition or kit for treating cancer in a specific human subject, the method comprising
 - a. selecting two or more peptides, or one or more polynucleic acids or vectors that encode two or more peptides, wherein each peptide, or each encoded peptide, is up to 50 amino acids in length and comprises an amino acid sequence selected from SEQ ID NOs: 1 to 2786 and/or 5432-5931 that comprises a T cell epitope capable of binding to at least three HLA class I alleles and/or a T cell epitope capable of binding to at least three HLA class II alleles of the specific human subject; and
 - b. preparing a pharmaceutical composition or kit comprising the two or more peptides, or one or more polynucleic acids or vectors selected in step a.

13. A method of designing or preparing a peptide, or a polynucleic acid or vector that encodes a peptide, or a panel of peptides, or one or more polynucleic acid or vectors that encode a panel of peptides, for use in a method of inducing a T cell response against a target polypeptide, the method comprising
 - (i) selecting or defining a model human population comprising a plurality of subjects each defined by HLA class I genotype and/or by HLA class II genotype;
 - (ii) identifying for each subject of the model population:
 - (a) amino acid sequences of the target polypeptide that are a T cell epitope capable of binding to at least three HLA class I molecules of the subject;
 - (b) amino acid sequences of the target polypeptide that are a T cell epitope capable of binding to at least three HLA class II molecules of the subject;
 - (c) amino acid sequences of the target polypeptide that comprise a T cell epitope capable of binding to at least three HLA class I molecules of the subject

and a T cell epitope capable of binding to at least three HLA class II molecules of the subject; or

(d) amino acid sequences of the target polypeptide that both

a. are a T cell epitope capable of binding to at least three HLA class II molecules; and

b. comprise an amino acid sequence that is a T cell epitope capable of binding to at least three HLA class I molecules of the subject;

(iii) selecting a polypeptide fragment window length of between 9 and 50 amino acids;

(iv) identifying a fragment of the target polypeptide that

(a) has the length selected in step (iii); and

(b) comprises an amino acid sequence identified in any one of step (ii) (a) to (d) in the highest proportion of subjects in the model population;

(v) optionally testing the fragment identified in step (iv) against additional pre-defined criteria, rejecting the fragment if the further pre-defined criteria are not met, and repeating step (iv) to identify an alternative fragment of the target polypeptide that

(a) has the length selected in step (iii); and

(b) comprises an amino acid sequence identified in step (iv) in the next highest proportion of subjects in the model population;

(vi) optionally repeating step (iv) and further optionally step (v) in one or more further rounds, wherein a further fragment of the target polypeptide is identified in each round, and wherein in each round subjects are excluded from the model population if any of the fragments selected in step (iv) and not rejected in step (v) of any of the preceding rounds comprises an amino acid sequence identified in step (ii) for that subject; and

(vii) designing or preparing a peptide, a polynucleic acid or vector that encodes a peptide, a panel of peptides, or one or more polynucleic acids or vectors that encode a panel of peptides, wherein each peptide comprises one or more of the target polypeptide fragments identified in step (iv), (v) or (vi),

optionally wherein the polypeptide fragment is flanked at the N and/or C terminus by additional amino acids that are not part of the sequence of the target polypeptide antigen.

14. The method according to claim 13, wherein the target polypeptide is expressed by a pathogenic organism, a virus or a cancer cell, or is a cancer testes antigen, optionally wherein the target polypeptide is selected from the antigens listed in any of Tables 2 to 5.
15. The method according to claim 13 or claim 14, the method further comprising selecting one or more peptides, polynucleic acids or vectors designed or prepared according to the method of claim 13 or claim 14 for use in a method of vaccinating, providing immunotherapy to, or inducing a cytotoxic and/or helper T cell response in a subject, optionally wherein each of the one or more peptides, or encoded peptides, comprises an amino acid sequence that is
 - (a) a fragment of a polypeptide that is expressed by a pathogenic organism, a virus or a cancer cell; and
 - (b) a T cell epitope capable of binding to at least three HLA class I molecules of the subject or a T cell epitope capable of binding to at least three HLA class II molecules of the subject.
16. A panel of peptides, polynucleic acids or vectors designed and/or prepared according to the method of claim 13 or claim 14, or comprising or encoding two or more peptides designed and/or prepared according to the method of claim 13 or claim 14, or a panel of peptides, polynucleic acids or vectors selected according to the method of claim 15.
17. A pharmaceutical composition or kit comprising a panel of peptides, or one or more polynucleic acids or vectors encoding a panel of peptides, according to claim

- 16, wherein the composition or kit optionally comprises at least one pharmaceutically acceptable diluent, carrier, or preservative.
18. The pharmaceutical composition or kit according to claim 17 for use in therapy for vaccination, providing immunotherapy or inducing a cytotoxic T cell response in a subject, wherein the pharmaceutical composition or the panel of peptides, polynucleic acids or vectors of the kit are to be administered to the subject.
19. The pharmaceutical composition or kit according to claim 18, wherein one or more or each of the peptides or the encoded peptides comprises an amino acid sequence that is
- (a) a fragment of a polypeptide that is expressed by a pathogenic organism, a virus or a cancer cell; and
 - (b) a T cell epitope capable of binding to at least three HLA class I molecules of the subject or a T cell epitope capable of binding to at least three HLA class II molecules of the subject.